

Project 1640
Palomar Procedures



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1. Instrument Preparation and Dewar Procedures

1.1. Pump down procedure

- 1) First, hook up P1640 Lesker pressure gauge to the pressure sensor on the dewar (both shown in the photo below), and check the pressure. This gauge should be set to read in mbar, but scrolling through the electronic menus will allow you to adjust the settings (need more info here).

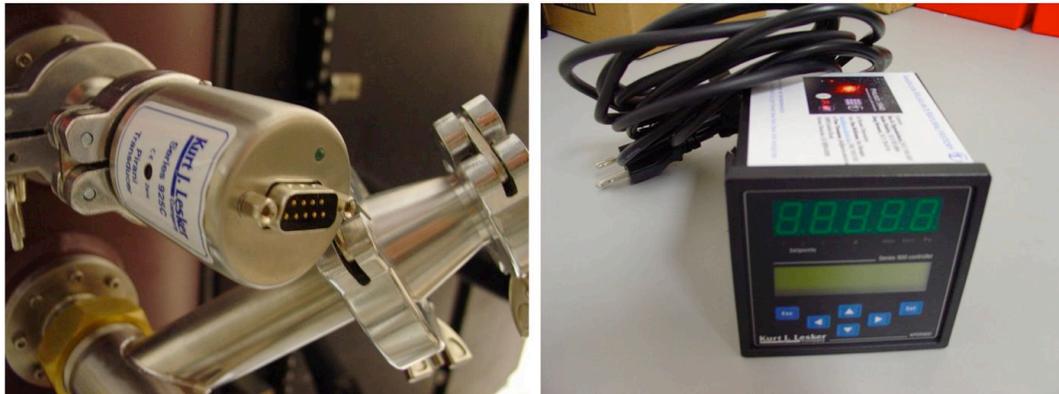


Figure 1. The P1640 pressure sensor, and the corresponding pressure gauge. The gauge can be read in either Torr or mbar.

- 2) Make sure the black-handled plunger is sealing the dewar closed, by ensuring the plunger is pushed all the way in. Remove the KF25 cap on the vacuum fitting and attach the vacuum pump.
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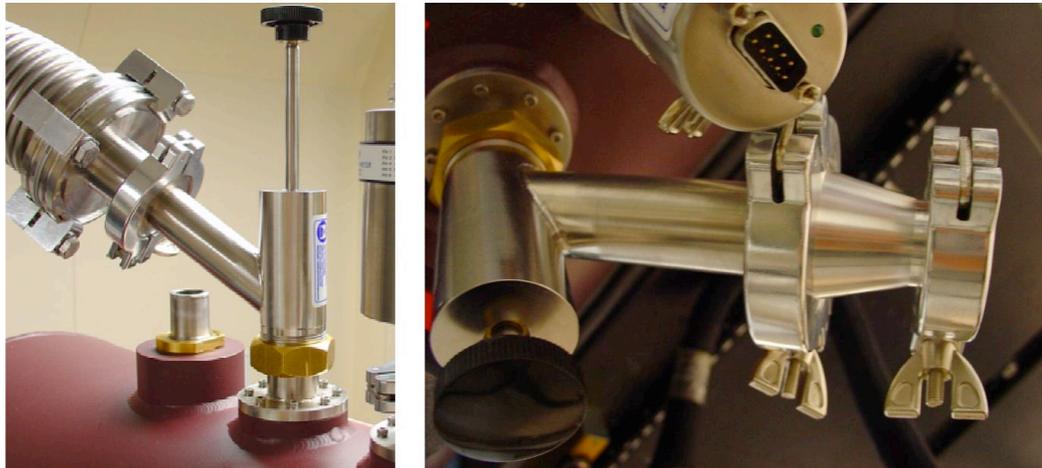


Figure 2. The P1640 vacuum valve. The left picture shows the black-handled plunger out (dewar open), while the right shows the plunger down (dewar closed). Also the KF40 to KF25 adapter is shown on the right.

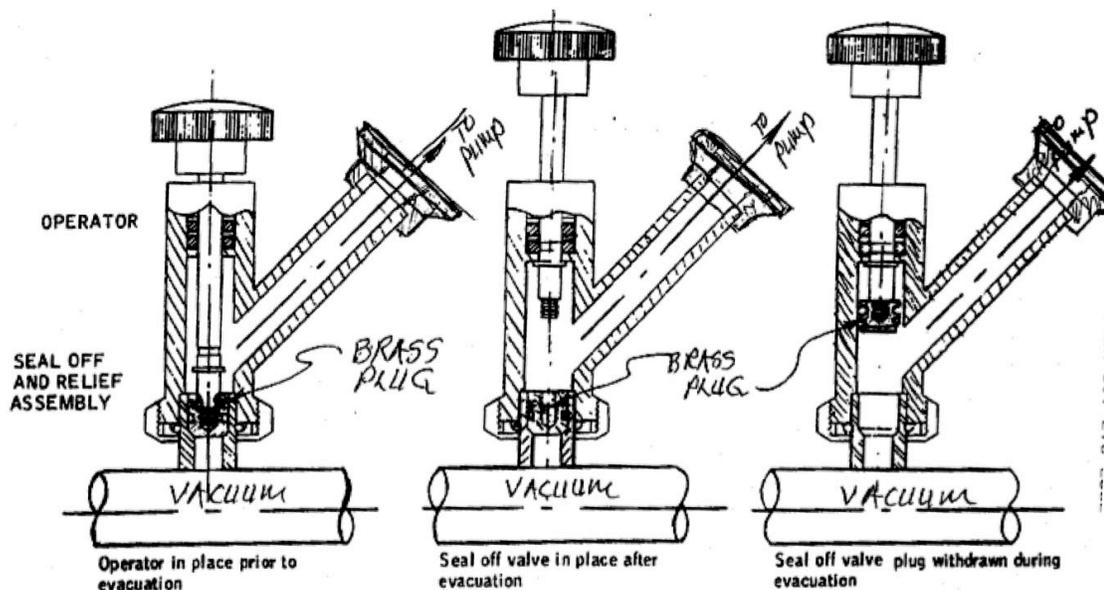


Figure 3. A diagram showing the inner workings of the brass plug which seals the dewar. Note that the black handle need not be unscrewed in any way. It only needs to be pushed or pulled in and out. Unscrewing will detach the shaft from the brass plug.

- 3) If the dewar internal pressure is room pressure, pull out the plunger (dewar open). Start the vacuum pump and verify that the pressure is going down on both the pump gauge and dewar gauge. If only the pump gauge shows a pressure drop, but not the dewar, either: a) the black handle has not been lifted, or b) if the black handle has been lifted, the brass plug is disconnected from the shaft, but still sealing the dewar (middle

- picture above). If this is the case, screw the handle back into the brass plug, and pull up to dislodge the brass plug.
- 4) If the pressure is significantly less than room pressure, leave the plunger pushed in (dewar closed), start pumping, and only release the plunger when the vacuum hose pressure is similar to the internal dewar pressure. Since the pressure in the vacuum hose is similar to the internal dewar pressure, it should be pretty easy to release the plunger.
 - 5) Continue to pump down until dewar the dewar reaches 0.2 – 0.1 mbar, (this may take 30-60 minutes). Close the plunger on dewar. The inner tank on the dewar is now ready for LN2.

1.2. Cool down procedure

Once the dewar has been evacuated down to 0.1 – 0.2 mbar, the inner (large) tank is safe to be filled. **The inner (small) tank can only be filled when the internal dewar temperature has dropped below about 95K. At no time prior to this should any Nitrogen be put into the inner tank. Doing so could destroy the detector system in the instrument. Note also that the placement of the two cans are different between PHARO and P1640.** In the “optics down” configuration (on the telescope, or on the AO spit), two LN2 vent tubes, one for each tank, are screwed into the two tanks to both allow the Nitrogen exhaust gas to vent as well as prevent the liquid from pouring out. These two tubes are screwed via their brass threaded midsections, and are nearly identical to those for PHARO (see photo).



Figure 4. Detail of one of the fill tubes (left), and showing how these are inserted into each tank.

Steps:

- 1) Verify that the pressure gauge is plugged in and is near 0.1 – 0.2 mbar.
-



Figure 5. The inner and outer tank fill ports. Each is identical to PHARO, but are in different places. Also, unlike PHARO insulating foam has been placed on the fittings.

2) To fill the outer can, one of two LN₂ stingers can be used: either the normal PHARO stinger, or the custom P1640 stinger. The stinger used for PHARO may stay in the tube better. To insert the stinger, the instrument must be rotated 30-40 degrees on its cart to allow access to the fill port. Remove the locking pin on the handling cart and allow the instrument to rotate. **Caution: The instrument will choose to rotate on its own, so be prepared for a rotation when the locking pin is removed.** Once the tube has been inserted, the instrument can be rotated back to its original position and the locking pin replaced.



Figure 6. The threaded locking pin on the handling cart. Use care when removing this, as the instrument will immediately rotate when this pin is removed (see photo below).



Figure 7. The locking pin is removed, and instrument is rotated in order to insert the LN2 stinger. This orientation is the instrument's natural orientation after the locking pin has been removed.

3) Allow the Nitrogen to flow freely into the large tank. It is a good idea to drive the 50L dewar with Dry nitrogen to keep the pressure up around 6 psi. The pressure on the guage will fall significantly to between $1e-03$ or $1e-04$ mbar during the fill.

4) The fill may take 20-30 minutes. Several fills over a few hours may be required to get the large tank full. Refill several times.

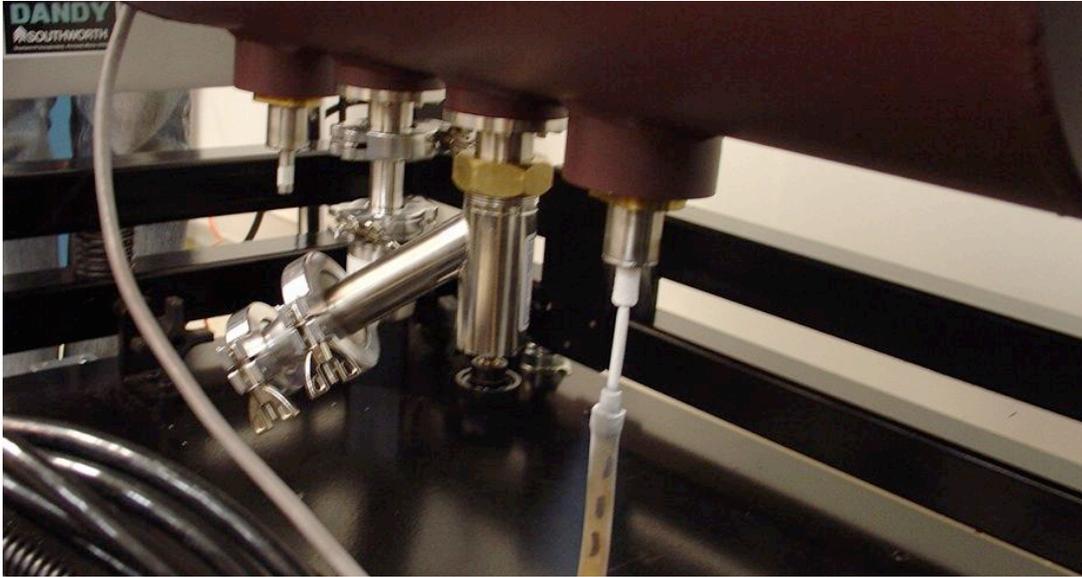


Figure 8. The liquid Nitrogen stinger used for PHARO placed into the large tank on P1640. During the initial cool down, only the large tank should be filled. No nitrogen should be put into the small tank if the internal temperature is above 95K. Note also that the insulating foam is not shown in this picture.

5) After several fills of the large tank, and roughly 24 hours, the small tank can be safely filled. Should we let the AMNH folks do that when we get here?

2. Installation

2.1. On telescope installation procedure

If the instrument and rack are being stored in the AO lab, both can be transported on their casters to the freight elevator and raised up to the observatory floor.

- 1) Prior to installation the IFU should be evacuated and cooled as per the procedure in Section 3.2.2 and 3.2.4.
 - 2) The instrument should already be mounted on its handling cart in the “optics down, pucks up” configuration.
 - 3) After the cage door has been removed, the Cassegrain ring needs to be rotated by 180°, shown in the figure below, with the widest part of the door in the North direction.
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Figure 9. The Cass cage has been rotated into the position needed for mounting.

- 4) The green handle on the handling cart must be removed via the two large nuts at its base before the instrument can be raised through the Cass cage door.
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Figure 10. The AO bench showing the four mounting pucks.



Figure 11. The orientation of the instrument on the Palomar ram must be aligned with its mounting place on the AO system.

- 5) The handling cart is placed onto the hydraulic ram in the same orientation as that which the instrument will be mounted on the AO bench (see photo below), which is the gold electronics box facing out. At this point the instrument is ready to be raised up on the ram.
- 6) Raise the instrument on the Ram so that the A-frame passes through the widest part of the cage door (see photo below).
- 7) Pump the handling cart pedal until the instrument lower platform (the yellow portion) is higher than the narrowest part of the Cass cage door (see photo below). When this has been achieved the cart can be moved towards the center of the cage.



Figure 12. The instrument being raised on the ram through the widest part of the Cass cage door.



Figure 13. The handling cart should be raised up via its pump mechanism until the yellow portion of the cart platform is higher than the narrowest part of the cass cage door. Then the cart can then be wheeled towards the middle of the cage.

- 8) As the instrument is lifted via the foot pump up to the four AO bench pucks, the six screw mechanisms on the handling cart (which reposition the handling cart A-frame in an “x-y” manner) are used to position the four P1640 pucks directly under the four AO bench pucks.
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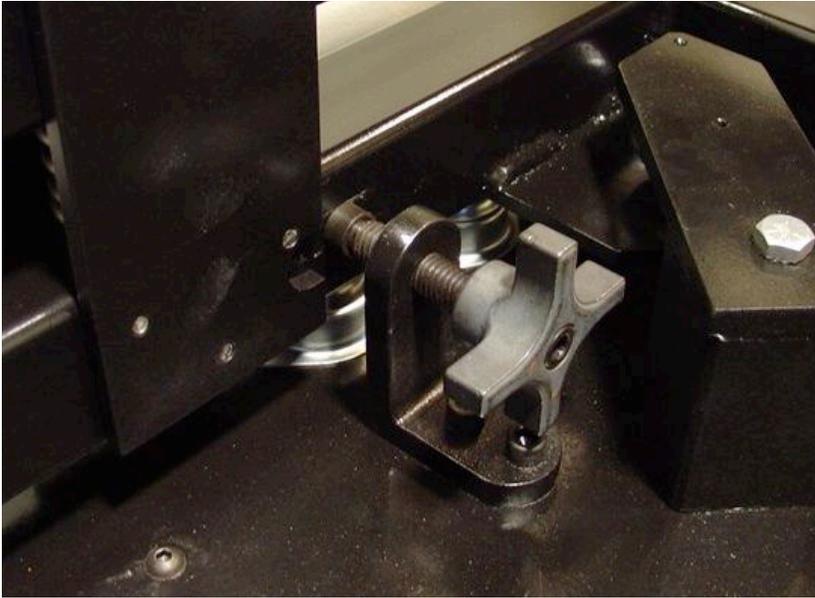


Figure 14. One of the six "x-y" adjustment screws. These are used to carefully align the four P1640 mounting pucks with the AO bench pucks.

- 9) As the instrument continues to rise up, one of the instrument pucks will invariably reach its corresponding puck on the PALAO bench first. Assuming that the pucks are well aligned, the instrument can continue to be raised upward. The six springs on the handling cart will allow the side that has reached the top first to compress, and all four pucks will eventually meet as the instrument is being pumped upwards.
 - 10) Once all four pucks are well aligned and flush with each other each puck pair can be clamped. The current clamp configuration is tricky and it may help to have two people working on a single clamp. Long ball drivers should be used as well.
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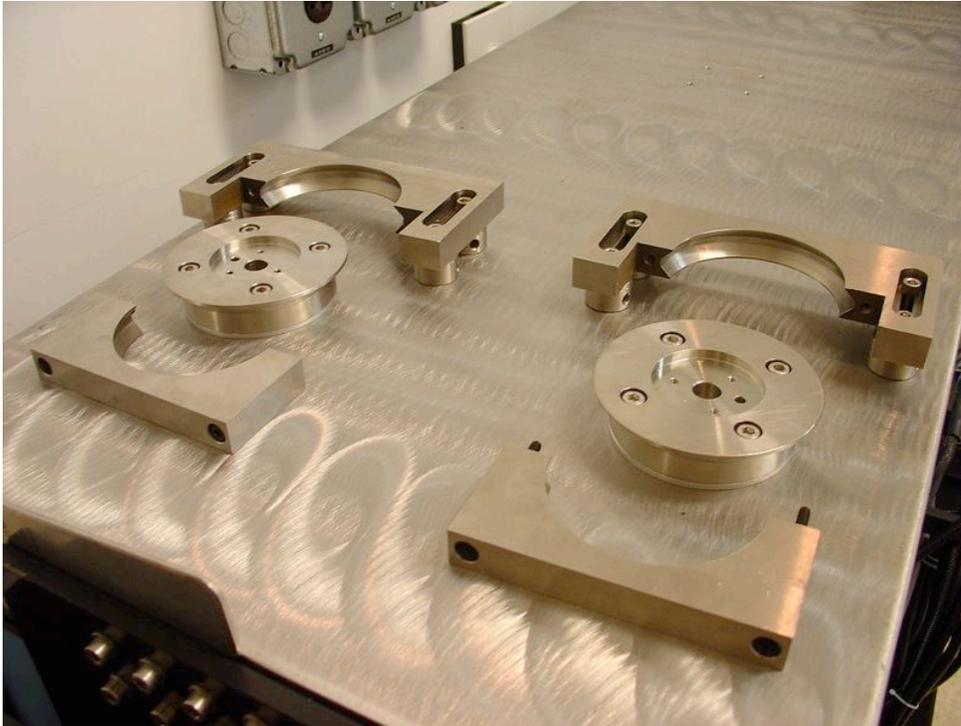


Figure 15. The mounting clamps. Note that these clamps have had some posts installed, which raise the clamps making the installation easier.

- 11) When the clamps are tightened, the eight M6 bolts on each of the instrument mounting plates can be removed. At this point, the instrument is fully mounted to the telescope and the handling cart can be lowered down and stored.
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Figure 16. The eight M6 screws used to secure the instrument to each mounting pad on the handling cart.

2.2. Mounting Electronics Rack

The electronics rack will be placed in position 5 shown in the figure below.

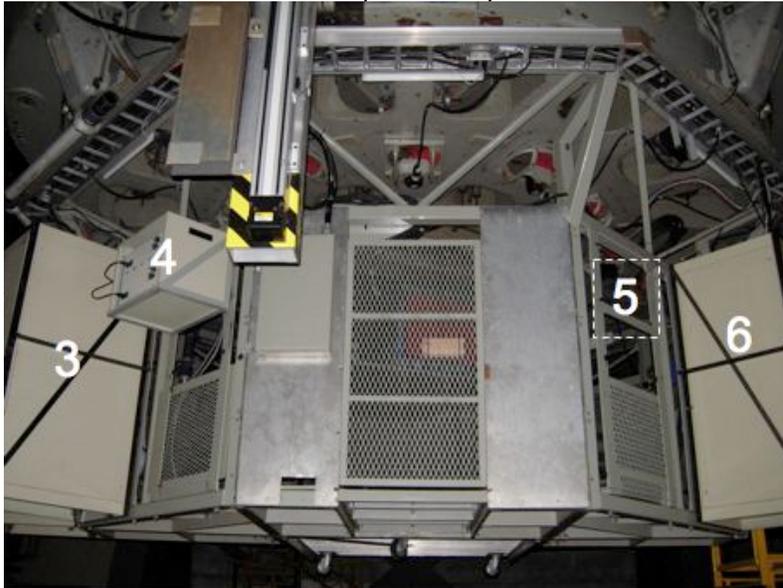


Figure 17. The P1640 electronics rack will be placed in position 5.

2.3. On PalAO spit in the AO Lab

Mounting the instrument on the AO bench on its spit is nearly identical to the mounting process on the telescope.

2.4. Cabling Procedure

2.5. Control Room Setup and Power-up Procedure

2.6. De-installation and stowage

2.7. Crating procedure

2.8. Transport and Shipping

Shipping from AMNH to New York was handled by Dietl, International (contact is Deirdre O'Connell, 212-400-9555, doconnell@dietl.com) via aircraft. Airport supervision was in place at both JFK and LAX airports. The delivery to the Observatory was handled by a covered, air-ride truck. The crates were unpacked in the ground floor of the 200" dome, before moving the contents into the AO lab. The empty crates will be stored at Palomar. When shipping the instruments in the future, the same procedures need to be followed.

Table 1. Weights for all project components.

Project Component	Weight (lbs)
Handling cart + instrument	990
Handling cart alone	550
IFU + Coronagraph (with Nitrogen)	440
Electronics rack (with all cabling)	394
